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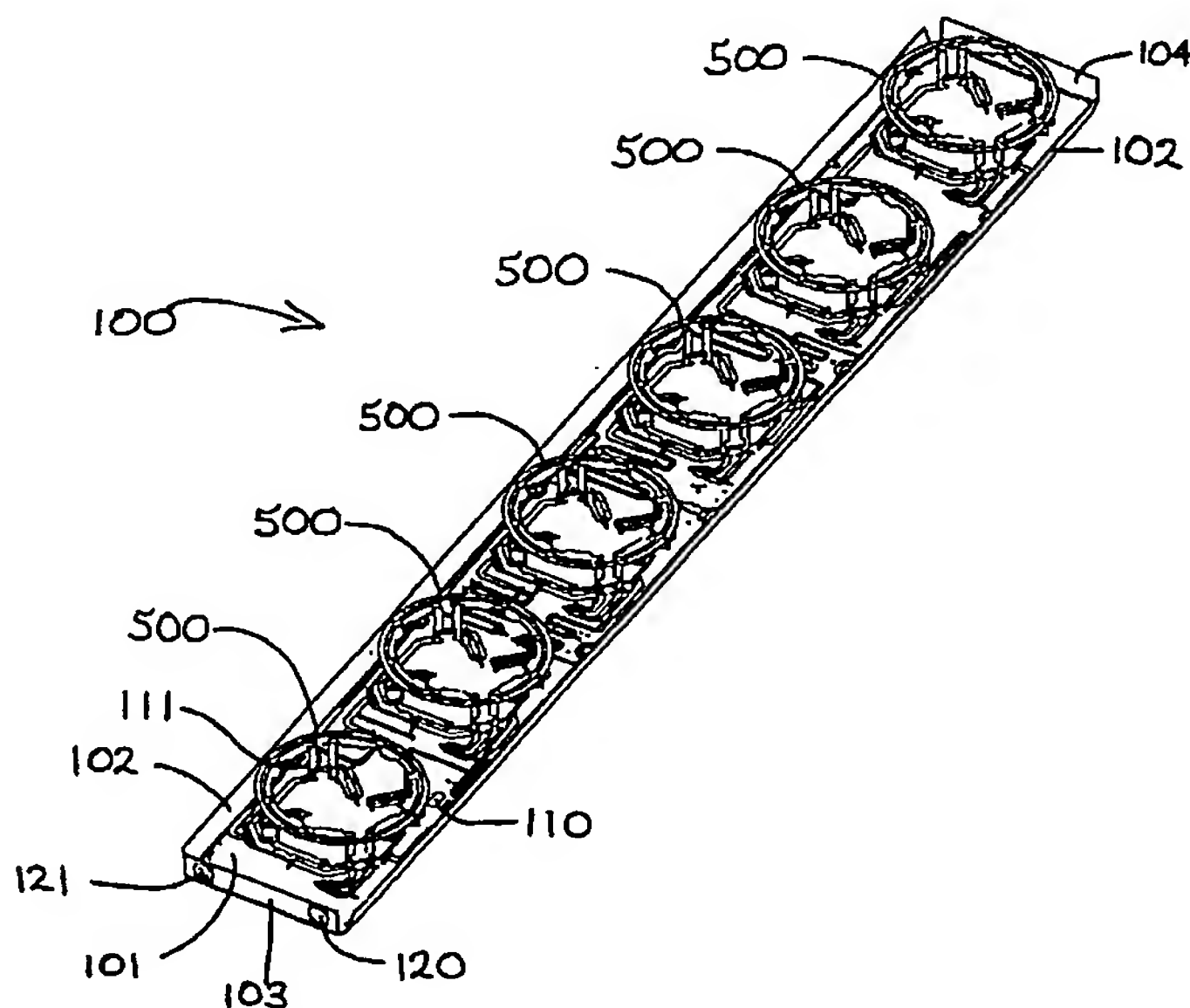
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[Continued on next page]

(54) Title: IMPROVEMENTS RELATING TO DIPOLE ANTENNAS AND COAXIAL TO MICROSTRIP TRANSITIONS



(57) Abstract: The invention relates in part to a folded dipole having a dipole axis and a pair of arms which together have a profile which is concave on one side and convex on the other when viewed along the dipole axis. The dipoles may be arranged as a dipole box around a central region, typically in a generally circular or square configuration. Further elements may be placed in the dipole box or in the gaps between dipole boxes. The antenna may be a single-band antenna, or a multi-band antenna with the further elements operating in a different frequency band to the dipole boxes. The further elements may be concentric dipole boxes. The invention is particularly suited for use in a cellular base station panel antenna. A novel coaxial to microstrip transition is also described.

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European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/36256

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01Q 21/26
US CL : 343/795, 797

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 343/795, 797, 815, 817

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
East

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 4,115,778 A (SNOW) 19 September 1978, see fig. 3.	1-6, 8-9, 12, 16-17, 38-43 ----- 7, 10-11, 13-15, 18-31, 44-92
Y	US 3,680,135 A (BOYER) 25 July 1972, see fig. 7.	7, 10-11, 13-15, 18-31, 44-92
Y	US 6,333,720 B1 (GOTTL et al.) 25 December 2001, see fig. 4.	48-92



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

15 January 2005 (15.01.2005)

Date of mailing of the international search report

25 JAN 2005

Name and mailing address of the ISA/US

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/36256

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-31 and 38-92

Remark on Protest

☐
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

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BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-31 and 38-92, drawn to a dipole antenna element.

Group II, claim(s) 32-37, drawn to an insulating retaining element for a dipole element.

Group III, claim(s) 93-106, drawn to a coaxial to microstrip transition.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Invention III is a coaxial to microstrip transition whose concept concerns the guided propagation of energy and technical features in relation thereto, Invention II is a retaining element whose concept concerns insulating electrical elements and the technical features required for such, and Invention I is an antenna whose concept concerns radiating energy and the radiator shapes that constitute its technical features.